

# 2002 EDITION

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## INSTRUCTOR

### Hazardous Materials Transportation Training Modules

#### **MODULE 6D** **Carrier** **Requirements** **(Water)**



U.S. Department of Transportation  
Research and Special Programs  
Administration



# Script

## Visual

## Narrative

1



This module is based on Part 176 of the HMR and discusses the requirements for accepting and/or transporting hazardous materials by most commercial vessels, foreign or domestic, when in the navigable waters of the United States. Exceptions are found in 176.5(b). Part 176 requirements for vessel transportation are in addition to those contained in Parts 171, 172, and 173 of the HMR.

2



The 49 CFR allows carriers of hazardous materials by vessel to use the International Maritime Dangerous Goods Code as long as they also conform to the requirements listed in section 171.12 and 176.11.

3



Part 176 is divided into Subparts A through O. Subparts A through D provide general operating requirements, as well as general handling, stowage, and segregation requirements. Subparts E through F provide special requirements for transport vehicles and barges loaded with hazardous materials. Subparts G through O provide detailed requirements for specific classes of hazardous materials.

## 4

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Definitions for the terms used in Part 176 are given in 176.2. Familiarity with these terms is important in properly applying the regulations in this part. Spend some time looking at these definitions, by reviewing 176.2 now.

## 5

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Each carrier must ensure that its employees involved in the transportation of hazardous materials are trained in accordance with the HMR, Part 172, Subpart H. The record of training required by 172.704(d) must be kept on board the vessel while the crewmember is in service on board the vessel.

## 6

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All hazardous materials must be prepared for transportation in accordance with Parts 172 and 173 of the HMR before they can be transported by vessel. Certain explosives or explosive compositions may not be transported by vessel under any circumstances. These are described in 173.54.

**Quick Review #1**

Instructions: Click and drag each of the terms shown here to fill in the blanks below. Click on the DONE button when you are finished.

Terms:

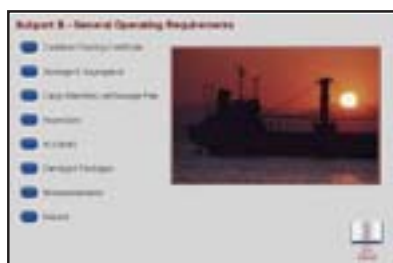
A. 171      B. 172      C. 173      D. 176      E. IMDG      F. ICAO

Statements:

1. The \_\_\_\_\_ Code may be used instead of the 49 CFR if it meets the requirements in 171.12 and 176.11.
2. The Carrier Requirements (Water) module discusses requirements for accepting and/or transporting hazardous materials by vessel as found in the HMR, Part \_\_\_\_\_.
3. The HMR, Part \_\_\_\_\_, and Part 176, requires carriers to train each Hazmat employee.

**Correct Answers:**

1. E IMDG
2. D 176
3. B 172

**7**

Hazardous materials transported by vessel must be properly described on the shipping paper as described in Part 172. Click each button to learn more about these requirements.

## 8



At the time the shipment is offered for transportation by vessel, the person responsible for packing or loading a freight container or transport vehicle containing hazardous materials must provide the vessel operator with a signed container packing certificate stating at a minimum that the: container or transport unit is serviceable for the material loaded therein, it contains no incompatible goods, and is properly marked, labeled, and placarded; and that the packages contained within the container have been properly inspected, marked, labeled or placarded, secured and are not damaged. The signed certification may be on the shipping paper or on a separate document that states, "It is declared that the packing of the container has been carried out in accordance with the provisions of 49 CFR 176.27 (c)."

## 9



The term stowage as used in this lesson refers to where a cargo may be located on the vessel and how it is secured. The term segregation refers to a separation of hazardous cargo from other hazardous cargoes by distance or barriers. Stowage and segregation are critical on a vessel because of the forces and stresses that affect it while it is underway. Rotational and linear forces can cause shifts of cargo that can result in significant damage.

## 10



The carrier must prepare a dangerous cargo manifest, list, or stowage plan for materials subject to the requirements of 49 CFR or the IMDG Code. A list of the information required is shown here. This document must be kept in a designated holder on or near the vessel's bridge. Each carrier must retain a copy of the dangerous cargo manifest for at least one year.

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## 11



After stowage is complete, the carrier shall conduct an inspection of each hold or compartment containing hazardous materials. This is to ensure that stowage has been accomplished properly and that there are no visible signs of damage. Additional inspections shall be done after periods of heavy weather, and, unless the vessel is equipped with smoke- or fire-detecting systems that have an automatic monitoring capability, every 24 hours.

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## 12



If an accident occurs on board a vessel involving hazardous materials, damaged packages or the emergency use of unauthorized packagings may be used, but may not be offered to any forwarding carrier for transportation. The master of the vessel shall notify the nearest United States Coast Guard Captain of the Port (COTP) to request instructions for disposition of the packages. Hazardous materials may be jettisoned only if the master believes this action is necessary to prevent or substantially reduce a hazard to human life or reduce a substantial risk to property.

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## 13



A carrier may not transport by vessel any damaged package containing hazardous materials that appears to have leaked or may leak. Packages may be repaired or restored to the satisfaction of the master of the vessel. A package containing radioactive materials may not be repaired or restored.

## 14

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A carrier may not knowingly transport by vessel any hazardous material offered under a deceptive name, marking, and invoice or shipping paper. If a shipment is found to be in violation while in transit, the master of the vessel shall take whatever measures necessary to ensure the safety of the vessel, its passengers, and its crew. If the vessel is in port, the material may not be delivered to any party, and the master shall immediately notify the nearest Captain of the Port and request instructions for disposal of the material.

## 15

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Repairs involving welding, burning, and power-actuated tools and appliances that may produce intense heat may not be done on a vessel that has explosives or other hazardous materials on board unless the emergency repairs are necessary for safety reasons, or the work has previously been approved by the Captain of the Port.

**Quick Review #2**

Your task is to complete this crossword puzzle based on the information presented in this topic. To answer an item, move the cursor to the first letter in one of the words and begin typing. Use your cursor or the tab key to move from item to item. When you have completed the puzzle, click the DONE button. You can make up to three attempts to complete the puzzle.

**ACROSS**

1. Damaged packages containing hazardous materials may be contained in \_\_\_\_\_ packaging, only in emergency situations.
2. Each person who offers hazardous materials for transportation must provide a signed container packing \_\_\_\_\_ stating that the packing of the container complies with the HMR.

**DOWN**

1. Packages that are \_\_\_\_\_ or have leaked may not be accepted by the carrier for transportation by vessel.
2. Damaged packages containing hazardous materials may not be offered to any forwarding \_\_\_\_\_ for transportation.
3. Where hazardous cargo is located on the vessel and how it is secured is termed \_\_\_\_\_.
4. A dangerous cargo manifest, list, or stowage plan must be prepared and kept on or near the vessel's \_\_\_\_\_.
5. Only \_\_\_\_\_ repairs or those authorized by the Captain of the Port may be done using heat-producing tools on a vessel carrying explosives or other hazardous materials.
6. How hazardous cargo is separated from other hazardous cargo is termed \_\_\_\_\_.

**Correct Answers:****ACROSS**

1. unauthorized
2. certificate

**DOWN**

1. damaged
2. carrier
3. stowage
4. bridge
5. emergency
6. segregation



## 16



Hazardous materials may be handled or stowed on board a vessel only under the direction and observation of a responsible person assigned this duty. On domestic vessels, this person must be a licensed officer assigned to the vessel, except that it may also be an employee of the carrier when the vessel is engaged in a coastwise voyage or on rivers, bays, sounds, or lakes. On a foreign vessel, the responsible person must be an officer of the vessel. Click on the buttons to learn more.

## 17



Before hazardous materials may be stowed on board a vessel, each hold or compartment must be free of debris. This requires examination of the bilges to ensure that residue from previous cargo has been removed.

## 18



Column 10 of The Hazardous Materials Table, 172.101, previously covered in Module 1, contains specific information relating to authorized vessel stowage locations. Column 10A, Vessel stowage, Location, specifies the authorized stowage locations on board cargo and passenger vessels. They are defined in 172.101(k). Column 10B, Vessel stowage, Other, specifies codes for vessel stowage requirements for specific hazardous materials. The meaning of each code found in Column 10B is defined in 176.84. Also note that Column 7 of the HMT specifies codes for special provisions applicable to hazardous materials. The meaning and requirements of each special provision is found in 172.102

## 19

**Student Activity #1**

The screenshot shows the Hazardous Materials Table (HMT) with the entry for Nitrous oxide, refrigerated liquid highlighted in yellow. The entry is located in Column 1 (Proper shipping name), Column 2 (Hazard class), Column 3 (Hazard label), Column 4 (P-Label), Column 5 (Packaging group), Column 6 (Special provisions), and Column 7 (Stowage category code).

Look up Nitrous oxide, refrigerated liquid, in the HMT. Looking at the entry in Column 7 (Special provisions) for Nitrous oxide, refrigerated liquid, we find “B6” listed.

**Student Activity #1**

The screenshot shows the Hazardous Materials Table (HMT) with the entry for Nitrous oxide, refrigerated liquid highlighted in yellow. A callout box explains the meaning of the 'B6' special provision code: "B6. For B6, B7 or B8, all cargo tanks, motor vehicles and railcars must be equipped with a safety relief device." and "B7. Safety relief devices are not required on motor vehicles and railcars. However, the safety relief device on motor vehicles and railcars must be made of steel."

Referring to 172.102, we find that “B6” indicates the requirement for the packaging to be made of steel. Moving across to Column 10A, we find the stowage category code “B”.

**Student Activity #1**

The screenshot shows the Hazardous Materials Table (HMT) with the entry for Nitrous oxide, refrigerated liquid highlighted in yellow. A callout box explains the meaning of the 'B' stowage category code: "B. Stowage category B. This category is for materials that are not permitted to be carried on passenger vessels. It is also not permitted to be carried on cargo vessels with more than 12 passengers. It is permitted to be carried on cargo vessels with 12 or fewer passengers. It is also permitted to be carried on cargo vessels with more than 12 passengers if the cargo is stowed in a secure location and is not accessible to passengers. It is also permitted to be carried on cargo vessels with more than 12 passengers if the cargo is stowed in a secure location and is not accessible to passengers."

Referring to 172.101(k)(2)(i) and (ii), we read that this hazardous material may be carried on a cargo vessel or a passenger vessel, but the location of stowage depends on the number of passengers if carried on a passenger vessel.

**Student Activity #1**

The screenshot shows the Hazardous Materials Table (HMT) with the entry for Nitrous oxide, refrigerated liquid highlighted in yellow. A callout box explains the meaning of the '40' stowage category code: "40. Stowage category 40. This category is for materials that are not permitted to be carried on passenger vessels. It is also not permitted to be carried on cargo vessels with more than 12 passengers. It is permitted to be carried on cargo vessels with 12 or fewer passengers. It is also permitted to be carried on cargo vessels with more than 12 passengers if the cargo is stowed in a secure location and is not accessible to passengers. It is also permitted to be carried on cargo vessels with more than 12 passengers if the cargo is stowed in a secure location and is not accessible to passengers."

Moving over to Column 10B, we see the entry “40”. Looking in 176.84(b), Table of Provisions, we determine that the entry “40” means Stow “clear of living quarters”. Now we understand the packaging and stowage restrictions placed on the shipment of a quantity of Nitrous oxide, refrigerated liquid, on either a passenger or cargo vessel.

## 20

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If the prescribed stowage location is shown to be impractical for a vessel, the Captain of the Port may authorize in writing an alternative stowage location or method of segregation as long as it will afford the same level of safety.

## 21

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Hazardous materials must be stowed in a manner that will facilitate inspection during the voyage, removal of them from a potentially dangerous situation, and the removal of packages in case of fire. If a package contains liquid hazardous materials, it must have orientation markings on it and be stowed in that position.

## 22

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Marine pollutants must be properly stowed and secured to minimize the hazards to the marine environment without impairing the safety of the ship and the people on board.

## 23



A metal bale hook may not be used for handling any packages of hazardous materials. Equipment designed to lift or move cargo by means of pressure exerted on the package may not be used if the package was not designed to be moved in that manner or if it could cause damage to the package. Any other equipment used must supply adequate support to the packages to prevent them from falling during loading.

## 24



Shown here are guidelines pertaining to the stowage of hazardous materials on decks of vessels.

## 25



When carrying transport vehicles, freight containers, and portable tanks containing hazardous materials by vessel, the conditions shown here must be met.

## 26

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Power-operated trucks or cargo handling vehicles, like forklifts, must conform to the requirements of 176.78 before they may be used on board a vessel in a space containing hazardous materials. Truck ratings and special operating conditions are designated in 176.78, while minimum safety features are identified in 176.78(f).

### **Quick Review #3**

Instructions: Click and drag each of the terms shown here to fill in the blanks below. Click on the DONE button when you are finished.

Terms:

- |           |            |              |                |
|-----------|------------|--------------|----------------|
| A. debris | B. water   | C. radiation | D. orientation |
| E. 50%    | F. 40%     | G. secured   | H. wrapped     |
| I. 176.78 | J. 172.101 |              |                |

Statements:

1. Each hold or compartment must be free of \_\_\_\_\_ before hazardous materials may be stowed there.
2. A package containing liquid hazardous materials must have \_\_\_\_\_ markings and be stowed in the indicated position.
3. No more than \_\_\_\_\_ of the open deck area should be used for stowage of hazardous materials.
4. When carrying transport vehicles or freight containers containing hazardous materials, all packages within the vehicle must be \_\_\_\_\_ to prevent movement in any direction.
5. Forklifts must conform to the requirements of \_\_\_\_\_ before they may be used on board a vessel in a space containing hazardous materials.

### **Correct Answers:**

1. A debris
2. D orientation
3. E 50%
4. G secured
5. I 176.78

## 27



General requirements for segregation are found in Part 176, Subpart D. When hazardous materials are stowed together, they must be segregated according to the General Segregation Table found in 176.83(b). Additional requirements for segregation are found in Column 10B of the Hazardous Materials Table 172.101. Additional notes for Class 1 (explosive) materials can be found in 176.84(c)(2). If the requirements differ, the most restrictive segregation requirements must be applied.

## 28

 A screenshot of the General Segregation Table. The table has a vertical column on the left labeled "Class" and a horizontal column on the top labeled "Division". The table contains various codes and descriptions for hazardous materials. The table is titled "General Segregation Table" and includes a note about the table's purpose.

The General Segregation Table is read by finding one class of material in the vertical column,

 A screenshot of the General Segregation Table. The table has a vertical column on the left labeled "Class" and a horizontal column on the top labeled "Division". The table contains various codes and descriptions for hazardous materials. The table is titled "General Segregation Table" and includes a note about the table's purpose.

and then finding another class in the horizontal column.

 A screenshot of the General Segregation Table. The table has a vertical column on the left labeled "Class" and a horizontal column on the top labeled "Division". The table contains various codes and descriptions for hazardous materials. The table is titled "General Segregation Table" and includes a note about the table's purpose.

Follow each column to where they intersect.

**General Segregation Table**

Click on the button below to learn more about what is required under each of the four primary segregation requirements.

Class	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

The intersection point contains a number or symbol that represents the method of segregation that must be used between the two classes.

**General Segregation Table**

Click on the button below to learn more about what is required under each of the four primary segregation requirements.

Class	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

The terms associated with these numbers and symbols are listed at the bottom of the table.

## 29

**Segregation Table Definitions**

The following table lists the segregation methods that are required under each of the four primary segregation requirements.

Class	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

Click on each button to learn more about what is required under each of the four primary segregation requirements.

**Segregation Table Definitions**

The following table lists the segregation methods that are required under each of the four primary segregation requirements.

Class	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

**Segregation Table Definitions**

The following table lists the segregation methods that are required under each of the four primary segregation requirements.

Class	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

[illegible][illegible]

30

**Student Activity 42**

How do different materials conduct heat? Do different materials expand?

Material	Thermal Conductivity (W/mK)	Thermal Expansion (ppm/K)
Aluminum	205	23
Copper	401	16.5
Steel	50	11.7
Brass	109	18.7
Concrete	1.4	10
Wood	0.1	3-5
Insulation	0.03	0.5

Look up Hydrogen, compressed in the HMT, 172.101.

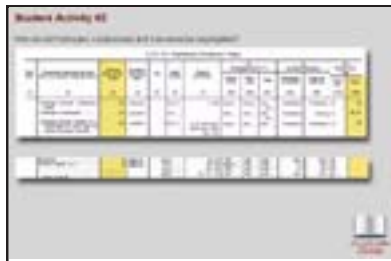
**Business Activity 62**

How do different types of businesses and products compare?

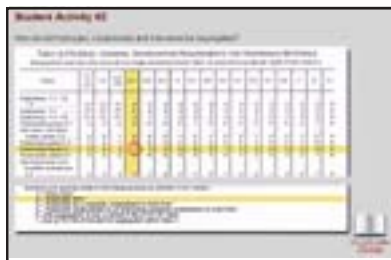
Business	Product	Price	Quantity	Revenue	Profit	
1. McDonald's	Big Mac	\$1.50	100	\$150.00	\$75.00	100
2. Target	Small Soda	\$0.50	100	\$50.00	\$25.00	100
3. Amazon	Kindle	\$139.99	10	\$1,399.90	\$699.95	10
4. Nike	Shoe	\$100.00	10	\$1,000.00	\$500.00	10
5. Apple	iPhone	\$699.99	10	\$6,999.90	\$3,499.95	10
6. Walmart	Small Soda	\$0.50	100	\$50.00	\$25.00	100
7. Starbucks	Latte	\$2.50	100	\$250.00	\$125.00	100
8. Tesla	Model S	\$69,999	10	\$699,990	\$349,995	10
9. Google	Pixel	\$649.99	10	\$6,499.90	\$3,249.95	10
10. Microsoft	Surface	\$599.99	10	\$5,999.90	\$2,999.95	10
11. Amazon	Kindle	\$139.99	10	\$1,399.90	\$699.95	10
12. Nike	Shoe	\$100.00	10	\$1,000.00	\$500.00	10
13. Apple	iPhone	\$699.99	10	\$6,999.90	\$3,499.95	10
14. Walmart	Small Soda	\$0.50	100	\$50.00	\$25.00	100
15. Starbucks	Latte	\$2.50	100	\$250.00	\$125.00	100
16. Tesla	Model S	\$69,999	10	\$699,990	\$349,995	10
17. Google	Pixel	\$649.99	10	\$6,499.90	\$3,249.95	10
18. Microsoft	Surface	\$599.99	10	\$5,999.90	\$2,999.95	10
19. Amazon	Kindle	\$139.99	10	\$1,399.90	\$699.95	10
20. Nike	Shoe	\$100.00	10	\$1,000.00	\$500.00	10
21. Apple	iPhone	\$699.99	10	\$6,999.90	\$3,499.95	10
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32. Tesla	Model S	\$69,999	10	\$699,990	\$349,995	10
33. Google	Pixel	\$649.99	10	\$6,499.90	\$3,249.95	10
34. Microsoft	Surface	\$599.99	10	\$5,999.90	\$2,999.95	10
35. Amazon	Kindle	\$139.99	10	\$1,399.90	\$699.95	10
36. Nike	Shoe	\$100.00	10	\$1,000.00	\$500.00	10
37. Apple	iPhone	\$699.99	10	\$6,999.90	\$3,499.95	10
38. Walmart	Small Soda	\$0.50	100	\$50.00	\$25.00	100
39. Starbucks	Latte	\$2.50	100	\$250.00	\$125.00	100
40. Tesla	Model S	\$69,999	10	\$699,990	\$349,995	10
41. Google	Pixel	\$649.99	10	\$6,499.90	\$3,249.95	10
42. Microsoft	Surface	\$599.99	10	\$5,999.90	\$2,999.95	10
43. Amazon	Kindle	\$139.99	10	\$1,399.90	\$699.95	10
44. Nike	Shoe	\$100.00	10	\$1,000.00	\$500.00	10
45. Apple	iPhone	\$699.99	10	\$6,999.90	\$3,499.95	10
46. Walmart	Small Soda	\$0.50	100	\$50.00	\$25.00	100
47. Starbucks	Latte	\$2.50	100	\$250.00	\$125.00	100
48. Tesla	Model S	\$69,999	10	\$699,990	\$349,995	10
49. Google	Pixel	\$649.99	10	\$6,499.90	\$3,249.95	10
50. Microsoft	Surface	\$599.99	10	\$5,999.90	\$2,999.95	10

Take special note of the hazard or division class in column 3 and any numbers in column 10 B.





Now do the same thing for Kerosene. Again, take special note of the hazard or division class in column 3 and any numbers in column 10B.



Now use the General Segregation Table to determine the required segregation requirements.

## 31



There are separate segregation tables for freight containers on board container vessels and transport units carried on board trailerships and trainships. Click on the buttons to view these segregation tables.



## 32



A transport vehicle, a private automobile, or a motorboat containing hazardous materials may be transported on board ferry vessels subject to the conditions found in Part 176, Subpart E.

## 33



Packaged hazardous materials may be transported on board barges provided the barge is constructed of steel and is not the type of barge with hopper type compartments and fitted with either bottom or side dumps. Special permits from the Captain of the Port (COTP) may be required for carrying certain hazardous materials. Refer to 176.99 for a list of these materials. However, a barge loaded with these materials being placed on, removed from, or handled on board a barge-carrying vessel is not subject to these permits. Barges carried on board barge-carrying vessels must be stowed in accordance with the requirements in 176.77, Subpart C.

## 34



Before Divisions 1.1 and 1.2 may be discharged from or loaded on board a vessel in the United States, the Carrier must obtain a permit from the COTP. The COTP may assign a US Coast Guard supervisory detail to any vessel during loading, handling, or unloading Class 1 (explosive) materials.

## 35

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Section 176.104 lists specific points concerning the loading and unloading of Class 1 (explosive) materials.

## 36

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## 37

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A responsible person who is aware of the hazards involved in handling Class 1 (explosive) materials and the steps to be taken in an emergency must be in constant attendance during loading, unloading and stowage of Class 1 (explosive) materials, including the preparation of the holds.

## 38



176.116 sets forth general stowage conditions for Class 1 (explosive) materials. They include keeping this material away from heat sources, dry, secured and fully braced.

## 39



Electrical equipment and cables in compartments where Class 1 (explosive) materials are stowed must be disconnected from the power source or, if energized, must meet minimum requirements for grounding and safety defined in 46 CFR, Subchapter J, Chapter I.

## 40



Ordinary stowage is authorized for most explosive articles carried by vessel except those requiring “magazine” or “special” stowage. Click on each button to learn more.

## 41



Magazine stowage is required for all explosive substances except for “Explosive Substances, n.o.s.” in compatibility groups G, L, or S. A compatibility group is designated by a letter used to categorize explosive substances and articles for purposes of stowage and segregation. Table 1 in section 173.52 contains a description for each compatibility group.

## 42



Magazine stowage is sub-divided into three different types of magazines designated by the letters A, B, and C. Click each button to learn more about these three types of magazine stowage.



## 43



Closed transport vehicles may be used as magazines to transport Class 1 (explosive) materials by vessel if they meet the requirements of the appropriate magazine stowage type and any additional requirements listed in 176.168.

## 44



Special stowage is required for certain articles presenting both explosive and chemical hazards. Section 176.136 lists stowage requirements for specific Class 1 (explosive) articles and substances. Summaries are shown here.

## 45



Each portable magazine used for the stowage of Class 1 (explosive) materials on board vessels must meet the requirements summarized here and explained in detail in Section 176.137.

## 46



Class 1 (explosive) materials may not be stowed within a horizontal distance of 6 meters (20 feet) of any fire, machinery exhaust, galley uptake, locker used for combustible stores, or other potential sources of ignition, or within at least 8 meters (26 feet) of the bridge, accommodation areas, and lifesaving appliances. Freight containers containing Class 1 (explosive) materials may be overstacked by containers of compatible Class 1 (explosive) materials or non-hazardous cargo only on vessels fitted with container fastening arrangements. Where vessels are not fitted with container fastening arrangements, freight containers loaded with Class 1 (explosive) materials may only be stowed on the bottom tier of the stowage.

**Quick Review #4**

Instructions: Your task is to complete these statements based on the information presented in this topic. Complete each of the statements by filling in the term that properly completes the statement.

**ACROSS**

1. Part 176, Subpart G, provides detailed requirements for carrying Class 1 (\_\_\_\_\_) materials by vessel.
2. According to the general stowage conditions described in 176.116, Class 1 (explosive) materials must be stowed away from all \_\_\_\_\_ including steam pipes, heating coils, sparks, and flames.
3. A copy of the \_\_\_\_\_ and certification must be provided to the vessel's representative for any transport vehicle containing hazardous materials that is to be carried on board a ferry vessel.
4. Many explosive \_\_\_\_\_ must be stowed in magazines.

**DOWN**

1. Class 1 (explosive) materials stowed on deck must be carried close to the vessel's \_\_\_\_\_ line and must not be stowed within 20 feet of any potential sources of ignition.
2. A magazine may be a \_\_\_\_\_ structure in the vessel or a closed freight container.
3. \_\_\_\_\_ magazines must meet the requirements found in 176.137.
4. Packages of Class 1 (explosive) materials may not be thrown, dropped, rolled, dragged, or slid over each other or over a \_\_\_\_\_.
5. Closed transport vehicles may be used as \_\_\_\_\_ if they meet the necessary requirements.

**Correct Answers:****ACROSS**

1. explosive
2. heat sources
3. shipping papers

**DOWN**

1. center
2. fixed
3. portable
4. deck
5. magazines

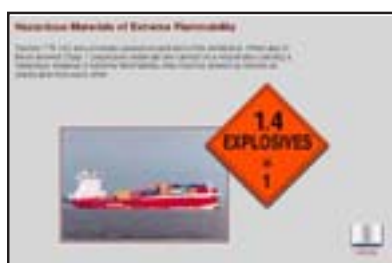


47



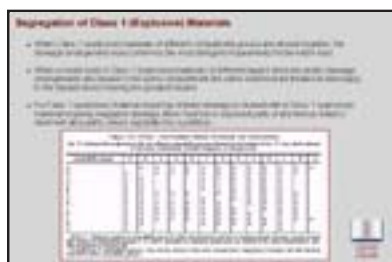
In general, Class 1 (explosive) materials must be segregated from other packaged hazardous materials in accordance with 176.83. Click on each button to learn about these segregation requirements.

48



Certain hazardous materials of extreme flammability may not be transported in a vessel carrying Class 1 (explosive) materials. These prohibited materials are listed in Section 176.142.

49



Section 176.144 contains this table showing authorized mixed stowage for explosives within the same compartment, magazine, portable magazine, or transport unit. Exceptions to this table are found in Section 176.145.



## 50



With the exception of mail, baggage, and personal and household effects, Class 1 (explosive) materials need not be segregated from other cargo of a non-dangerous nature. Explosives with a secondary hazard of POISON or CORROSIVE must be stowed separately from all foodstuffs.

## 51



Specific precautionary measures involving artificial lighting, radio and radar use, fueling, security, fire precautions and firefighting are required to be followed during the loading and unloading of Class 1 (explosive) materials. Click each button to learn more



**Prevention During Loading and Unloading**

- ☐ Addressing
- ☐ Safety Considerations
- ☐ Training
- ☐ Instructional Strategies
- ☐ Preparing the Environment
- ☐ Details
- ☐ Equipment and Technology



Students should be able to identify the various types of loading and unloading equipment used in the industry and the safety considerations associated with each.

**Prevention During Loading and Unloading**

- ☐ Addressing
- ☐ Safety Considerations
- ☐ Training
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- ☐ Preparing the Environment
- ☐ Details
- ☐ Equipment and Technology



Students should be able to identify the various types of loading and unloading equipment used in the industry and the safety considerations associated with each.

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- ☐ Details
- ☐ Equipment and Technology



Students should be able to identify the various types of loading and unloading equipment used in the industry and the safety considerations associated with each.

**Prevention During Loading and Unloading**

- ☐ Addressing
- ☐ Safety Considerations
- ☐ Training
- ☐ Instructional Strategies
- ☐ Preparing the Environment
- ☐ Details
- ☐ Equipment and Technology



Students should be able to identify the various types of loading and unloading equipment used in the industry and the safety considerations associated with each.

**Prevention During Loading and Unloading**

- ☐ Addressing
- ☐ Safety Considerations
- ☐ Training
- ☐ Instructional Strategies
- ☐ Preparing the Environment
- ☐ Details
- ☐ Equipment and Technology



Students should be able to identify the various types of loading and unloading equipment used in the industry and the safety considerations associated with each.

**Quick Review #5**

Instructions: Click and drag each of the terms shown here to fill in the blanks below. Click on the DONE button when you are finished.

Terms:

- |                 |               |                  |               |
|-----------------|---------------|------------------|---------------|
| A. dangerous    | B. entry      | C. exit          | D. fire       |
| E. flammability | F. loaded     | G. non-dangerous | H. segregated |
| I. smoke        | J. volatility |                  |               |

Statements:

1. Class 1 (explosive) materials must be \_\_\_\_\_ from other packaged hazardous materials in accordance with 176.83.
2. Class 1 (explosive) materials and certain hazardous materials of extreme \_\_\_\_\_ may not be transported on the same vessel.
3. Class 1 (explosive) materials do not need to be segregated from other \_\_\_\_\_ cargo except for mail, baggage, and personal and household effects.
4. During loading and unloading of Class 1 (explosive) materials, sources of \_\_\_\_\_ are prohibited on or near the vessel.
5. No unauthorized \_\_\_\_\_ may be permitted into spaces containing Class 1 (explosive) materials.

**Correct Answers:**

1. H segregated
2. E flammability
3. G non-dangerous
4. D fire
5. B entry

**52**

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The transport of Class 1 (explosive) materials is restricted on passenger vessels as described in 176.166. Class 1 (explosive) materials which may be carried on passenger vessels are found in Column 10 of the HMT. Authorized materials must be stowed in accordance with Table 176.166(b) shown here.

## 53



Transport vehicles carrying Class 1 (explosive) materials must be properly secured and meet the structural serviceability requirements in 176.172. Class 1 (explosive) materials of different compatibility groups must be stowed in different vehicles, and those vehicles must be separated from each other.

## 54



Freight containers carrying Class 1 (explosive) materials may be transported on vessels only under the conditions listed here.

## 55



Special handling requirements are prescribed for the handling of Class 1 (explosive) materials while in port. Some of these special requirements involve the use of signals, mooring lines and watchkeeping. Click each button to learn more.





## 56



Section 176.194 describes the special requirements for the stowage of Class 1 (Explosive) materials on a magazine vessel. Review Section 176.194 for additional specifics.

## 57



Cylinders of Class 2 (compressed gas) materials must be stowed in such a way that the cylinders do not make direct contact with the vessel's deck, side, or bulwark. They must be kept as cool as practicable, be stowed away from all sources of heat and ignition, and be kept separate from all foodstuffs. Click each button to learn about the requirements for "on-deck" and "under-deck" stowage.

## 58



Cylinders of Class 2 (compressed gas) may not be stowed "on-deck" over a hold or compartment containing coal and must be protected from radiant heat, including the direct rays of the sun.

## 59

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Cylinders of Class 2 (compressed gas) when stowed “under deck” must be mechanically ventilated with no source of artificial heat and clear of living quarters.

## 60

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Class 3 (flammable) or combustible liquid must be kept as cool as reasonably possible and be stowed away from all sources of heat and ignition. If equipped with a vent or safety relief device, they must be stowed “on deck” only.

## 61

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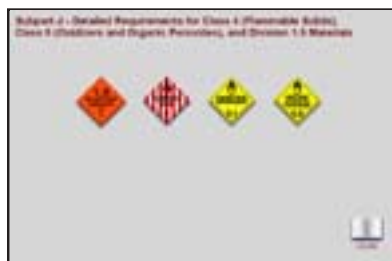
A dry chemical, foam fire extinguisher or a fire hose fitted with an approved portable mechanical foam nozzle must be kept accessible to the tank it is intended to cover.

## 62



Only flashlights suitable for use in locations where fire or explosion hazards are possible may be used. Smoking or the use of an open flame is prohibited in any hold or compartment containing Class 3 (flammable) or combustible liquid, and warning signs must be posted.

## 63



Class 4 (flammable solids) and Division 5.2 (organic peroxide) materials must also be kept cool and be stowed away from all sources of heat and ignition. Division 5.2 materials must be stowed away from living quarters or access to them. Division 1.5 or Class 5 (oxidizers and organic peroxides) may not be stowed in the same hold or compartment with any readily combustible material or in or near a hold containing sulfur in bulk.

## 64



Transporting Division 1.5, ammonium nitrate, and ammonium nitrate mixtures require special provisions and procedures. Review Section 176.410 to learn more about these requirements. Under certain circumstances, written permission from the nearest COTP is necessary before Division 1.5, ammonium nitrates, and certain ammonium nitrate fertilizers may be loaded on or unloaded from a vessel at any waterfront facility. Section 176.415 details these requirements.



## 65



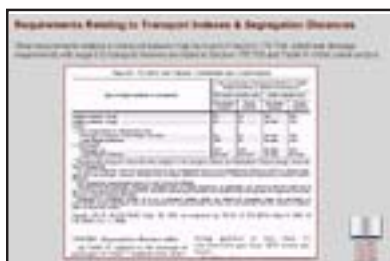
Each package of material required to have a POISON GAS, POISON INHALATION HAZARD, or POISON label, being transported on a vessel, must be stowed clear of living quarters and any ventilation ducts serving living quarters and separated from foodstuffs, except when the hazardous materials and the foodstuffs are in different closed transport units.

## 66



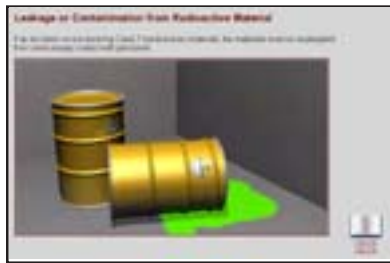
A package of radioactive materials with a surface temperature of more than 5°C (9°F) above the ambient air may not be overstowed with any other cargo. If the package is stowed under deck, the hold or compartment must be ventilated.

## 67



Packages of Class 7 (radioactive) materials should be marked with transport indexes. The sum of these indexes may not exceed the limits specified in Section 176.704, Table III.

68



If an accident occurs involving Class 7 (radioactive) materials, the materials must be segregated from unnecessary contact with personnel. If the package has leaked, the hold or compartment containing the cargo must be isolated. The hold or compartment may not be used for any other cargo until it has been decontaminated in accordance with Section 176.715.

69



General stowage requirements for Class 8 (corrosive materials) materials are found in 176.800 and include prohibitions against stowing these materials near living quarters, foodstuffs, combustible materials or cotton.

70



When break bulk Class 8 materials are stowed on deck, provisions must be made in case of leakage. Dunnage must be provided on the deck and arranged so that any leakage will be apparent. Any leakage that occurs must be washed down, using liberal quantities of water.

**71**

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Cotton and vegetable fibers that are transported on a vessel must be securely baled and bound. Each bale must be covered with bagging on at least three-fourths of its surface. Each bale of wet cotton must be stowed separately from dry bales of cotton or vegetable fiber.

**Quick Review #6**

Instructions: Click and drag each of the terms shown here to fill in the blanks below. Click on the DONE button when you are finished.

Terms:

- |               |                       |            |          |
|---------------|-----------------------|------------|----------|
| A. 172.101    | B. 176.166            | C. crew    | D. drink |
| E. blue light | F. foodstuffs         | G magazine | H. truck |
| I. red light  | J. fire extinguishers |            |          |

Statements:

1. Special restrictions that apply to Class 1 (explosive) materials being transported on passenger vessels are found in \_\_\_\_\_.
2. Freight containers may be regarded as a \_\_\_\_\_.
3. A vessel handling Class 1 (explosive) materials in port must exhibit a “B” (Bravo) flag by day and an all-round \_\_\_\_\_ by night.
4. A vessel in port must have sufficient \_\_\_\_\_ on board to maintain a proper watch if it is carrying Class 1 (explosive) materials.
5. Class 8 (corrosive materials) must be stowed away from living quarters and \_\_\_\_\_.

**Correct Answers:**

1. B 176.166
2. G magazine
3. I red light
4. C crew
5. F foodstuffs

# Module 6D Test

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1. Regulations for carrying hazardous material by vessel are found in 49 CFR, Part 176.  
  
A. True  
B. False
  
2. The person responsible for packing or loading a freight container or transport vehicle must provide a signed container packing certificate.  
  
A. True  
B. False
  
3. A dangerous cargo manifest, list, or stowage plan must be prepared and kept in a designated holder on or near the vessel's bridge.  
  
A. True  
B. False
  
4. A damaged package containing radioactive material may be repaired to the satisfaction of the Master of the Vessel.  
  
A. True  
B. False
  
5. An inspection of a compartment or hold containing hazardous material must be performed after stowage is complete and after periods of heavy weather.  
  
A. True  
B. False
  
6. The dangerous cargo manifest must contain:  
  
A. Name of the vessel and official number  
B. Nationality of the vessel  
C. Stowage location of hazardous material on board vessel  
D. All of the above

7. When hazardous materials are stowed together, they must be segregated according to the:

- A. General Segregation Table, 176.83(b)
- B. Hazardous Material Table
- C. Captain of the Port (COTP)
- D. A. and B.

8. Repairs involving welding, burning, and power actuated tools and appliances that may produce intense heat may not be done on a vessel that has explosives or other hazardous material on board unless:

- A. Performing emergency repairs to the vessel's main propelling or boiler plant or auxiliaries is for safety purposes.
- B. Work is being performed under approval from the Captain of the Port.
- C. Repair work is being done on damaged packages of hazardous materials.
- D. A. and B.

9. When carrying freight containers loaded with packages of hazardous materials by vessel:

- A. all packages in the container must be secured to prevent movement in any direction.
- B. the weight in the container must be evenly distributed.
- C. all hazardous materials must be contained entirely within the freight container.
- D. all of the above

10. Detailed requirements for Class 1 (Explosive) materials are found in Part 176, Subpart:

- A. E
- B. F
- C. G
- D. H

11. When loading or unloading Class 1 (Explosive) materials:

- A. a combination of woven rope and wire sling may be used.
- B. unpalletized packages may be slid over a deck.
- C. only safety hooks or a hook that has been closed by wire may be used.
- D. packages may be lifted over other hazardous material.

12. General stowage conditions for Class 1 (Explosive) material include:

- A. They must be stowed away from heat sources or all other sources of ignition.
- B. All compartments must remain locked or secured to prevent unauthorized entry.
- C. Stowage spaces must be dry.
- D. All of the above

13. Magazine stowage is required for:

- A. most explosive substances.
- B. most explosive articles.
- C. most hazardous materials.
- D. most chemical hazards.

14. When loading or unloading Class 1 (Explosive) materials:

- A. arc lights are the only form of lighting permitted.
- B. radio and radar transmitters must not be used.
- C. vessels may not be fueled unless authorized by the COTP.
- D. All of the above.

15. When in port, a vessel containing Class 1 (Explosive) materials must:

- A. fly an A (Alpha) flag.
- B. have mooring arrangements that can be released quickly in an emergency.
- C. have a flashing red light.
- D. B. and C.

16. If an accident occurs on board a vessel carrying hazardous materials:

- A. the hazardous material may be jettisoned if the Master of the Vessel believes this action is necessary to prevent or reduce hazard to human life and property.
- B. the Master of the Vessel may determine the disposition of the packages.
- C. damaged packages may be contained in unauthorized packaging units until it can be forwarded to another carrier for transportation.
- D. All of the above.

**Module 6D Test Answers**

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Question	Answer/Explanation	49 CFR Reference
1.	A. True.	
2.	A. True.	
3.	A. True.	
4.	B. False.	
5.	A. True.	
6.	D. All of the above.	
7.	D. A and B.	
8.	D. A and B.	
9.	D. all of the above.	
10.	C. G (Subpart G).	
11.	C. only safety hooks or a hook that has been closed by wire may be used.	
12.	D. All of the above.	
13.	A. most explosive substances.	
14.	C. vessels may not be fueled unless authorized by the COTP.	
15.	B. have mooring arrangements that can be released quickly in an emergency.	
16.	A. the hazardous material may be jettisoned if the Master of the Vessel believes this action is necessary to prevent or reduce hazard to human life and property.	